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## INK JET RECORDING SHEET AND MANUFACTURE THEREOF

[Claim(s)]

[Claim 1] In an ink jet recording sheet which provides a recording layer in at least one field of a base paper, said recording layer consists of 40% of the weight or more of paints, and 60 or less % of the weight of a binder, and. An ink jet recording sheet, wherein the ten-point average of roughness height on this surface of a recording layer is 5 micrometers or less and air permeability as a recording form is 1,000 or less seconds.

[Claim 2] The ink jet recording sheet according to claim 1 whose paints in a recording layer are the calcium carbonate compound silica of a particulate structure which silica crystallized mainly to a calcium carbonate crystal.

[Claim 3] The ink jet recording sheet according to claim 1 or 2 whose 75-degree specular gloss on the surface of a recording layer is not less than 70%.

[Claim 4] The ink jet recording sheet according to any one of claims 1 to 3 containing resin which a binder in a recording layer solidifies with formate.

[Claim 5] The ink jet recording sheet according to claim 4 whose resin solidified with formate is casein.

[Claim 6] 40% of the weight or more of paints.

60 or less % of the weight of resin solidified with formate.

While the surface which is a manufacturing method of an ink jet recording sheet provided with the above, and carried out coating of the recording layer coating liquid to the base paper surface is in a damp or wet condition, said binder is solidified with formate, and a machined surface subsequently heated is stuck by pressure and dried.

## [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the ink jet recording sheet which can acquire high printing quality especially about the ink jet recording sheet recorded using a water-based ink.

[0002]

[Description of the Prior Art] Although an ink jet recording method breathes out the glob of ink with various mechanisms and it records by forming a dot by making it adhere on a record paper, There is no noise compared with a dot impact type recording method, and full-color-izing is easy, and also high speed printing is possible, and there is an advantage, such as being. On the other hand, since the ink used for ink jet recording is a water-based ink which usually used a direct color, acid dye, etc., there is a fault that drying property is bad.

[0003] As the characteristic demanded from an ink jet recording sheet of being used for such an ink jet recording method, it is mentioned the breadth of \*\* dot, that there are [ that \*\* ink drying rate is quick, that \*\* printing density is high, ] few blots of the shape of a mustache, etc.

[0004] \*\* In order to improve, conventionally, silica with big specific surface area, etc. were contained, the ink-jet-recording layer was provided, and enlarging ink absorption was performed. However, if ink absorption is enlarged in vain, printing density will fall. Then, in order to improve this fault, controlling the amount of openings has been performed so that JP,63-22997,B may see.

[0005] On the other hand, high resolution and high definition are more needed from progress of the latest ink jet printer, and diversification of needs. However, since the smooth nature of the surface of the recording layer is low, it becomes what the high grade feeling of image quality lacked, and also dot shape did not become a perfect circle, therefore the ink jet recording sheet which provided the recording layer using paints with the conventional big specific surface area was not enough in the reproducibility of a picture. So, in order to improve the smooth nature of the surface of a recording layer, when a super calender etc. are processed to an ink jet recording sheet conventional paints coating type. Although gloss and smooth nature improved, since porous structure peculiar to an ink-jet-recording layer was crushed, the absorbed amount and rate of absorption of ink fell, and drying property got worse.

[0006] On the other hand, by this type, although some ink jet recording sheets were resin coating type [ surface / smooth ] comparatively, since paints with big specific

surface area were hardly included, there was a fault [ of ink / the absorbed amount or rate of absorption ] intrinsically that it was low. Since the water-based ink which dissolved the color in water in ink jet recording is used, when moisture adheres, Since there was a fault of the picture after printing bleeding or flowing out, and water soluble resin was usually used when it is especially a resin coating type, there was a fault that this tendency was remarkable.

[0007]

[Problem(s) to be Solved by the Invention]In order to solve the above-mentioned conventional fault, as a result of examining many things about an ink jet recording sheet, the gloss and smooth nature of a recording surface are high, and also this invention persons had the high absorbed amount and rate of absorption of ink, also discovered that a water resisting property could be given to a picture, and resulted in this invention. Therefore, the smooth nature of the surface of a recording layer is high, and is excellent in the high grade feeling of image quality, and the purpose of this invention is to provide an ink jet recording sheet with high absorbed amount of ink and rate of absorption.

[0008]

[Means for Solving the Problem]In an ink jet recording sheet which provides a recording layer in at least one field of a base paper, said recording layer consists of 40% of the weight or more of paints, and 60 or less % of the weight of a binder, and the above-mentioned purpose of this invention. The ten-point average of roughness height on this surface of a recording layer is 5 micrometers or less, and it was attained by ink jet recording sheet, wherein air permeability as a recording form is 1,000 or less seconds. Paints used by this invention can be suitably chosen from publicly known paints used for ink jet recording sheets so that a postscript may be carried out, but as for the specific surface area, it is preferred that it is 40-600m<sup>2</sup>/g.

[0009]While a coating layer containing such paints generally has good ink absorbency, a surface degree of brilliancy falls. Although gloss and smooth nature improve when a super calender etc. are processed, since porous structure is crushed, ink absorbency falls. So, in this invention, in order to reconcile ink absorbency and smooth nature, a method of sticking a coating surface in a damp or wet condition after coating to a heated machined surface by pressure, and drying is used. A drying method said here is the same as a manufacturing method of a cast-coated paper defined by JISP0001 (6043).

[0010]Since a machined surface will be copied without crushing porous structure of a coating surface if this method is adopted, ink absorbency and smooth nature can be reconciled. However, if this drying method is used, irrespective of a presentation of

coating liquid, it will not be that air permeability will be 1,000 or less seconds, and, in the case of the usual cast-coated paper for printing, air permeability will be about 1,500 seconds, for example. And in a paints coating type record paper for 1,000 seconds or more, an absorbed amount and a rate of absorption of ink are low, and air permeability cannot present practical use of ink jet recording at this appearance.

[0011] use / that specific surface area makes paints of 40-600 m<sup>2</sup>/g contain in this invention, and / namely / together / the above-mentioned drying method ] For the first time, the ten-point average of roughness height on the surface of a recording layer is 5 micrometers or less, and air permeability as a recording form realized an ink jet recording sheet for 1,000 or less seconds.

[0012] Paints used by this invention will not be limited especially if specific surface area is usually 40-600m<sup>2</sup>/g, but. For example, it can be used, choosing suitably from publicly known materials, such as silica by wet process, white carbon, silica gel, and superfines silica by a dry method, and also materials which silica crystallized, such as calcium carbonate compound silica of a particulate structure, can be used for a calcium carbonate crystal. It can be used even if it mixes these paints. When especially calcium carbonate compound silica is used, a thing excellent in gloss of a recording layer can be obtained. As for a compounding rate of paints in this invention, it is preferred in a recording layer that it is 40 % of the weight or more, and it is especially preferred that it is 45- % of the weight or more 80 or less % of the weight of the range.

[0013] Especially if a binder used by this invention is a drainage system binder, it is not limited, but. Although publicly known resin, such as casein, starch, polyvinyl alcohol, carboxymethyl cellulose, styrene butadiene series latex, and a vinyl acetate system emulsion, can be used choosing it suitably from what it was independent or was mixed, When using the solidifying method called especially gelling cast coat method, it is preferred to use casein as resin. As for a compounding rate of the above-mentioned binder, it is preferred in a recording layer that it is 60 or less % of the weight, and it is especially preferred that it is 20- % of the weight or more 55 or less % of the weight of the range.

[0014] In this invention, it is preferred to use a cationic polymer electrolyte together with the above-mentioned binder. That is, since this electrolyte reacts to an anionic basis like a water-soluble direct color currently used into ink, or a sulfonic acid group in a water-soluble-acid nature color molecule and forms an insoluble salt in water, its water resisting property of a recorded image improves.

[0015] As such a cationic polymer electrolyte, For example, polyvinylbenzyl trimethyl ammonium halide, PORIJI acrylic dimethylannmonium halide, There are a poly

dimethylaminoethyl methacrylate hydrochloride, polyethyleneimine, dicyandiamide formalin condensate, epichlorohydrin denaturation poly alkylamine, polyvinyl pyridium halide, other quarternary ammonium salt, polyamine, etc. As content of a cationic polymer electrolyte, it is preferred that it is 1 to 30 % of the weight among all the binders, and it is especially preferred that it is 5 to 20 % of the weight. In an ink-jet-recording layer in this invention, various general auxiliary agents other than the above-mentioned paints and a binder, such as a dispersing agent, a defoaming agent, a color, and a flow denaturing agent, may contain further if needed.

[0016]As a coating method of an ink-jet-recording layer in this invention, It can be used choosing suitably from coating methods using publicly known spreading machines, such as a braid coating machine used for manufacture of common paints coated paper, an air knife coater, a roll coater, a curtain coating machine, a bar coating machine, a photogravure coating machine, and a comma coating machine. A coating amount per one side can be arbitrarily adjusted with solid content conversion in 2-50m<sup>2</sup>/g and the range which cover the surface of a base paper and from which sufficient ink absorbency is acquired although it is 6-30m<sup>2</sup>/g preferably.

[0017]As described above, perform desiccation of an ink-jet-recording layer in this invention by being stuck to a machined surface which heated a coating surface in a damp or wet condition by pressure, but. As a damp or wet condition of a coating layer, there are a state where it does not dry just behind coating, a state which made gel at the time of un-drying after coating, and was used, and the state where it was made to plasticize with re-moist liquid after coating desiccation.

[0018]It is preferred to adopt the state where it was made to gel in this invention also in these states. In what is called this solidifying method, as a coagulant used for a solidified solution, for example Formic acid, Although it is common to use various kinds of salts, such as calcium, such as acetic acid, citrate, tartaric acid, lactic acid, chloride, and sulfuric acid, zinc, barium, lead, magnesium, cadmium, and aluminum, potassium sulfate, potassium citrate, way sand, way acid, etc., Especially in this invention, it is preferred to use formate.

[0019]A heated machined surface which is used by this invention means a thing of a drum which was usually heated by about 100 °C and which has the cylinder outside by which mirror surface finish was carried out. As a base paper used by this invention, papers, such as the usual paper of fine quality and a report grade paper, can be mentioned. Using for printing of the usual offset etc. can also use a record paper of this invention as a PPC sheet.

[0020]

[Effect of the Invention]As explained in full detail above, the ink jet recording sheet of this invention can improve not only the gloss of a recording surface but smooth nature by choosing a presentation and drying method of a coating layer, and also its absorbed amount and rate of absorption of ink are high, and it can also give a water resisting property to a picture. Since surface smooth nature is high, image quality has a high grade feeling, and also since dot shape becomes close to a perfect circle, it excels also in the reproducibility of a picture.

[0021]

[Example]This invention is not limited by this, although an example is given and this invention is explained further in full detail hereafter.

[0022]As example 1. paints, 60 % of the weight of calcium carbonate compound silica (fine seal CM-F: trade name by Tokuyama Soda Co., Ltd.) of specific surface area  $2\frac{1}{2}$  of 60 m<sup>2</sup>/g, As a binder, 35 % of the weight of casein (RAKUCHIKKU casein: trade name from New Zealand), The coating liquid of 30% of the concentration which consists of a solid content presentation of 1 % of the weight of calcium stearate (NOPUKOTO C-104: trade name by Sannopuko, Inc.) as 4 % of the weight of polyethyleneimine quarternary ammonium salt, and a release agent, The roll coat was carried out to the paper of fine quality for air permeability 45 seconds by basis weight  $2\frac{1}{2}$  of 90g/m, subsequently coating of the 10-% of the weight solution of calcium formate was carried out, and coagulation processing was carried out.

[0023]Next, while the obtained coating layer was in the damp or wet condition, it was stuck to the mirror plane of the cast drum heated by 90 °C by pressure, and dried, and the ink jet recording sheet of this invention was obtained. The coating amount in this case was 19.0 g/m<sup>2</sup> in dry weight %. The following examination was done using the obtained ink jet recording sheet. A result is as having been shown in Table 1.

(1) It measured according to ten-point average-of-roughness-height JIS B0601.

[0024](2) According to air permeability J.TAPPI No.5 B, it measured with the Oken-type air permeability tester.

(3) According to specular gloss JIS Z8741, it measured 75 degrees.

(4) After printing using a dot concentration color ink jet printer (IO-725: trade name by sharp incorporated company), Konica microdensitometer PDM-5 (made by Konica Corp.) was used, reflection density was measured, and the average value of five points was displayed.

[0025](5) The circularity coefficient image analyzer (made by ADS incorporated company) was used, the boundary length and area of the dot were measured, and the value given with a following formula was made into the circularity coefficient.

$$\text{円形度係数} = \frac{1}{\frac{(\text{周囲長})^2}{\text{面積}} \times \frac{1}{4\pi}}$$

[0026]As example 2. paints, 40 % of the weight of synthetic silica (Syloid 600: trade name made from Fuji DEVISON, Inc.) of specific surface area <sup>2</sup>[ of 600 m ]/g, As a binder, 15 % of the weight of styrene butadiene series latex (JSR-0801: trade name by Japan Synthetic Rubber Co., Ltd.), 20 % of the weight of polyvinyl alcohol (PVA-117: trade name by Kuraray Co., Ltd.), The roll coat of the coating liquid of 30% of the concentration which consists of a solid content presentation of 1 % of the weight of calcium stearate as 20 % of the weight of casein, 4 % of the weight of polyethyleneimine quarternary ammonium salt, and a release agent was carried out to basis weight 90 g/m<sup>2</sup> and the paper of fine quality for air permeability 45 seconds like Example 1. Subsequently, the ink jet recording sheet of this invention which carries out coating of the 10-% of the weight solution of calcium formate, coagulation processing is carried out, is stuck to the mirror plane of the cast drum heated by 90 \*\* by pressure, dries, and has a coating amount of 16.0 g/m<sup>2</sup> with dry weight was obtained. The test result of the obtained ink jet recording sheet is as having been shown in Table 1.

[0027]As example 3. paints, 60 % of the weight of calcium carbonate compound silica (fine seal CM-F) of specific surface area <sup>2</sup>[ of 80 m ]/g, As a binder, 15 % of the weight of styrene butadiene series latex (JSR-0801: trade name by Japan Synthetic Rubber Co., Ltd.), 20 % of the weight of casein (RAKUCHIKKU casein: trade name from New Zealand), The roll coat of the coating liquid of 30% of concentration which consists of a solid content presentation of 1 % of the weight of calcium stearate as 4 % of the weight of poly dimethylaminoethyl methacrylate hydrochlorides and a release agent was carried out to the paper of fine quality for air permeability 45 seconds by basis weight 90 g/m<sup>2</sup> like Example 1. Subsequently, coating of the 10-% of the weight solution of calcium formate was carried out, and coagulation processing was carried out, and it was stuck to the mirror plane of the cast drum heated by 90 \*\* by pressure, and dried, and the ink jet recording sheet of this invention which has a coating amount of 14.0 g/m<sup>2</sup> with dry weight was obtained. The test result of the obtained ink jet recording sheet is as having been shown in Table 1.

[0028] Instead of the calcium carbonate compound silica (fine seal CM-F) used as paints in comparative example 1. example 1, The synthetic silica (fine seal SP-20: trade name by Tokuyama Soda Co., Ltd.) of specific surface area  $^2$  of 30 m<sup>2</sup>/g was used, and also the record paper was obtained completely like Example 1. The coating amount of the obtained record paper was 18.0g/m<sup>2</sup> in dry weight. A test result is as having been shown in Table 1.

[0029] Instead of the synthetic silica (Syloid 600) used as paints in comparative example 2. example 2, the synthetic silica (FK700: Degussa trade name) of specific surface area  $^2$  of 700 m<sup>2</sup>/g was used, and also the record paper was obtained completely like Example 2. The coating amount of the obtained record paper was 16.0g/m<sup>2</sup> in dry weight. A test result is as having been shown in Table 1.

[0030] After having carried out the roll coat of the coating liquid of 30% of concentration which consists of the completely same solid content presentation as the comparative example 3. example 1 to the coat stencil paper of basis weight 90 g/m<sup>2</sup>, and performing the usual air blasting desiccation, without carrying out coagulation processing, super calender processing was carried out and the record paper was obtained. The coating amount in this case was 18.5 g/m<sup>2</sup> in dry weight %. A test result is as having been shown in Table 1.

[0031] The silica (fine seal CM-F) of specific surface area  $^2$  of 60 m<sup>2</sup>/g used as paints in comparative example 4. example 1 5 % of the weight, Casein was used 90% of the weight as a binder, and also the coating layer which consists of a solid content presentation which added 1 % of the weight of calcium stearate as 4 % of the weight of polyethyleneimine quarternary ammonium salt and a release agent was provided, and also the record paper was obtained completely like Example 1. The coating amount of the obtained record paper was 19.0g/m<sup>2</sup> in dry weight. A test result is as having been shown in Table 1.

[0032] It examined using the cast-coated paper (esprit coat F: trade name by Sanyo-Kokusaku Pulp Co., Ltd.) of basis weight <sup>2</sup> of 93g/m of comparative example 5. marketing. A test result is as having been shown in Table 1.

[0033]

[Table 1]



	顔料種類	顔料比 表面積 ( $\text{m}^2/\text{g}$ )	塗工層中の 顔料配合比 (重量%)	乾燥方法	塗工量 ( $\text{g}/\text{m}^2$ )	10点平 均粗さ ( $\mu\text{m}$ )	透気度 (秒)	75度鏡面 光沢度 (%)	インク 吸収 性	K <sub>7</sub> T 濃度	円形度 係数
実施例 1	炭加複合シリカ	60	60	鏡面圧着	19.0	1.0	750	86.3	○	0.88	0.83
実施例 2	合成シリカ	600	40	鏡面圧着	16.0	3.5	650	78.5	○	0.76	0.79
実施例 3	炭加複合シリカ	80	40	鏡面圧着	16.0	1.9	710	88.2	○	0.83	0.75
比較例 1	合成シリカ	30	60	鏡面圧着	18.0	1.0	900	68.3	×	0.73	0.49
比較例 2	合成シリカ	700	40	鏡面圧着	16.0	3.3	530	83.3	○	0.63	0.71
比較例 3	炭加複合シリカ	60	60	送風乾燥	18.5	9.5	250	5.5	○	0.81	0.40
比較例 4	炭加複合シリカ	60	5	鏡面圧着	19.0	1.0	1300	90.5	×	0.93	0.79
比較例 5	—	—	—	鏡面圧着	—	0.7	1500	89.7	×	0.38	測定不能

但し、表中の「炭カル」は「炭酸カルシウム」を意味する。

**Abstract:**

**PURPOSE:** To provide an ink jet recording sheet having high surface smoothness, excellent sophisticated feeling of picture quality, high ink absorption amount and absorption speed and a method for manufacturing the same.

**CONSTITUTION:** An ink jet recording sheet comprises a recording layer at least on one side surface of a base sheet in such a manner that the layer is formed of binder containing 40wt.% pigment and 60wt.% or less binder, 10 point mean roughness of a surface of the layer is 5 $\mu$ m or less and air permeability as recording sheet is 1,000sec or less.